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ON THE COLOR VARIATIONS OF THE COMMON GARTER SNAKE.

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I. *EUTÆNIA SIRTALIS* IN THE ADIRONDACK REGION OF NEW YORK.

IN an earlier paper¹ I have noted that Cope's treatment of the color forms of *Eutænia sirtalis*, at least so far as the subspecies occurring in the northeastern United States are concerned, can hardly be regarded as satisfactory. My acquaintance with the extreme western and southern forms of the species is entirely too limited to permit the expression of an opinion on the closeness with which his subspecific grouping, in those areas, approximates to the facts; but it seems probable that the same conditions prevail there as here.

In a catalogue² (now in press) of the reptiles and batrachians of New York, prepared by Dr. F. C. Paulmier and myself at the request of Dr. F. J. H. Merrill, director of the New York State Museum, no revision of Cope's grouping was attempted. All the subspecies described from this state by Cope and G. M. Allen were included, as it seemed undesirable, in a paper designed for popular use, either to omit these forms without presenting reasons for such action, or to discuss these reasons in the necessary detail.

For this reason the results of the collection work which has been accomplished during the past year, in critical localities, are presented in this paper.

My thanks are due to Dr. F. C. Paulmier, who has kindly placed the resources of the zoölogical department of the State Museum at my disposal, and to Mr. Raymond L. Ditmars, who

¹ Snakes of New York, *Amer. Nat.*, February, 1901.

² Paulmier, F. C., and Eckel, E. C. Catalogue of the Reptiles and Batrachians of New York, *Bulletin New York State Museum*.

has given me many facts regarding the distribution of the various color forms of the common garter snake.

It is to be regretted that the results so far obtained are chiefly negative, tending to cast doubt upon the tenability of previously described subspecies, without pointing out the direction in which we are to look for more significant variations. A large series of living specimens, collected in such widely separated areas as the Adirondacks, the Catskills, the Hudson Highlands, Long Island, the shore of Lake Ontario, and the counties of the "southern tier," might indicate the presence of certain variations which could be correlated with differences of habitat, or are associated with such other aids to polytypic evolution as would justify us in considering them as subspecies. It is hardly necessary to say that, for the purposes of this study, living specimens are absolutely essential. Colors alter so rapidly on immersion in alcohol that alcoholic specimens are worthless so far as color variations are concerned.

1. *Subspecies previously described from the Adirondacks.*

The subspecies of *Eutænia sirtalis* which have been noted as occurring north of Pennsylvania are as follows: *E. s. graminea* (Cope), *E. s. ordinata* (Linn.), *E. s. sirtalis* (Linn.), *E. s. obscura* (Cope), and *E. s. pallidula* (Allen). Of these, all save *E. s. graminea* have been found in the Adirondack region. In the present paper I purpose discussing the effect, upon the tenability of the subspecies *E. s. obscura* and *E. s. pallidula*, of the examination of material collected in New York state during the past field season. In a future paper I hope to discuss the remaining subspecies. The characters of *E. s. obscura* and *E. s. pallidula*, as given by Cope and Allen respectively, are as follows:

Eutænia sirtalis obscura (Cope).

Cope, in his last discussion¹ of this subspecies, describes it as a form in which the spots have entirely (or almost entirely)

¹ Cope, E. D. Crocodilians, Lizards, and Snakes of North America, *Rep. Nat. Mus.* (1898), p. 1074.

disappeared by fusion, leaving the stripes intact. The coloration above is therefore deep brown or almost black, with three yellowish stripes, of which the laterals are less distinct than the dorsal. The gastrosteges are grayish green, with the usual black spots near the ends.

In this subspecies he includes one specimen from Mitchell's Bay, Ontario; three from Lac qui Parle, Minnesota; and five from Westport, Essex County, New York. These last were collected by Baird and described¹ by him as *Eutænia sirtalis*.

The specimens assigned to the subspecies are, it is true, all from northern localities, but no definite statement is made as to the range of the form; and it is probable that Cope did not intend to associate this coloration with any particular area or life zone. A proposed subspecies, based upon specimens from widely scattered localities (the intervening areas being occupied by other subspecies), is, in general, to be regarded with suspicion, unless positive evidence, other than that afforded by similarity of coloration, can be adduced in favor of its subspecific value. Positive evidence of this character is rarely obtainable, particularly in the case of reptiles. In the case now under discussion, I believe that it can be shown that *obscura* intergrades completely with more typical forms of *Eutænia sirtalis*; that its color characters cannot be correlated with any particular climatic conditions; and that therefore individuals exhibiting these color characters cannot be regarded as subspecifically distinct from those showing the coloration of typical *Eutænia sirtalis*.

Eutænia sirtalis pallidula (Allen).

In 1899 G. M. Allen described² the subspecies *pallidula* from specimens taken near Intervale, N. H., giving its geographic distribution (p. 64) as "from the White Mountains of New Hampshire and the Adirondacks of New York northward into New Brunswick and Nova Scotia, and possibly farther." Later in the same paper (p. 65) he states that

¹ Baird, S. F., and Girard, C. *Catalogue of North American Reptiles* (1853), p. 31.

² Notes on the Reptiles and Amphibians of Intervale, N. H., *Proc. Bost. Soc. Nat. Hist.* (1899), p. 64 *et seq.*

pallidula is the characteristic form of the Canadian zone, and restricts "the name *Thamnophis sirtalis* Linn. to the brighter-colored form found in the Transition and Austral zones of the east." This restriction necessitates a redescription of *Eutenia sirtalis sirtalis*, which he accordingly gives. His summary of the differences between the two subspecies is as follows: "*Thamnophis sirtalis pallidula* needs comparison with no other of the *sirtalis* group except *T. sirtalis* proper, from which it differs in the obscurity of the dorsal stripe, which is grayish, not yellow; the ground color, which is olive brown, not black or blackish; in the chestnut color below the lateral stripe, where *sirtalis* is olive; in the lighter color of the belly, especially in the younger examples; and in the interlinear spots as previously described" (*i.e.*, the spots of *pallidula* were described as being composed of chestnut scales, with black edges and interspaces, and those of *sirtalis* proper as being composed of scales usually entirely black, occasionally faintly reddish in the middle).

As can be seen, this is an attempt to correlate a certain variation with a given "life zone"; and, if justified by the facts, would be a distinct advance upon the subspecific treatment of Cope. For this reason the question of its validity requires a more detailed discussion, for even a slight variation — if obviously arising from definite causes — is worthy of consideration. As will be seen later, however, I cannot admit that *pallidula* fulfills these necessary conditions. Not only do the characters assigned to it occur frequently in specimens outside of the Canadian zone, but all specimens from that zone do not exhibit these characters.

2. Specimens collected during 1901 in New York State.

Specimens from Moody, Franklin County, N.Y.

1. Dorsal stripe very faint, but still visible on close examination as a dull yellow-brown line. Lateral stripes fairly well shown; greenish yellow. Sides below lateral stripes brownish green. Gastrosteges greenish; black spot on anterior edges, near sides, often communicating by a thin black band along

anterior edge of the scutum with the lowest row of spots. Color, above lateral stripes, olive green. Interspaces (between scales) light greenish. Spots present, but not very marked. Scales composing spots chestnut, with black edges and interspaces.

Second upper labial on right side divided; left side normal. First temporal on both sides of head divided, its anterior portion appearing as a small separate triangular plate.

2. Dorsal stripe fairly distinct, lateral stripes less so. Sides below lateral stripes dark green. Gastrosteges greenish. Color above lateral stripes olive green; interspaces light greenish. Spots present, composed of chestnut scales, with black edges and interspaces.

3. Dorsal stripes almost invisible; lateral stripes fairly well shown. Sides below lateral stripes brownish. Gastrosteges greenish. Color above lateral stripes olive brown; interspaces light greenish. Spots very indistinct (owing to brownish background), composed of chestnut scales, with black edges and interspaces.

4. Dorsal stripe visible but not distinct. Lateral stripes visible; yellowish. Sides below lateral stripes light brown. Gastrosteges greenish. Color above lateral stripes olive brown; interspaces light greenish. Spots of chestnut scales, with black edges and interspaces.

5. Dorsal stripe almost invisible, only showing on close examination. Indications of lateral stripes on second and third scale rows; yellowish. Sides below lateral stripes light brown. Gastrosteges slate gray, tinged brownish. Color above lateral stripes olive brown; interspaces light greenish. Two rows of spots between lateral and dorsal stripes; the scales, in general, being black (a few, however, are chestnut, with black edges), with black interspaces. Another series of spots, similar in color, along the first and second scale rows.

6. Dorsal stripe visible throughout; yellowish. Lateral stripes faint. Sides below lateral stripes light brown. Gastrosteges slate gray. Other colors as in No. 5.

7. Dorsal stripe visible. Lateral stripes very faint. Sides below lateral stripes brown. Gastrosteges grayish, tinged with

brown. Color above lateral stripes olive brown. Interspaces light greenish. Spots of chestnut scales, with black edges and interspaces. Preocular divided on right side; left side normal.

8. Dorsal stripe very faint; lateral stripes faint. Color above lateral stripes brown, tinged olive. Interspaces light greenish. Four series of spots between lateral stripes. Scales of the spots chestnut, with black edges and interspaces. The four series connect across back, forming bars or network. Top of head deep green. Chin and throat orange. Rostral yellow. Lower labials white, tinged yellowish on upper edges. Upper labials yellow to yellowish green, black edges anteriorly. Sides below lateral stripes, together with exterior portions of gastrosteges, brown. Remaining portions of gastrosteges olive brown. Lower side of tail deep orange.

9. Dorsal stripe pure and rather deep yellow near head, becoming browner yellow and somewhat less distinct posteriorly. Lateral stripes yellow, rather distinct. Color above lateral stripes olive brown; interspaces light greenish. Spots present, not very distinct; composed of chestnut scales, with black edges and interspaces. Sides below stripes brown; gastrosteges lighter brown.

10. Dorsal stripe yellowish brown, distinct throughout. Lateral stripes brighter and somewhat more yellowish than the dorsal. Color above lateral stripes brown, tinged olive. Interspaces light greenish. Spots composed of chestnut scales, black borders and interspaces. Sides below stripes, as well as exterior edges of gastrosteges, a soft light brown. Remaining portions of gastrosteges greenish gray.

To the descriptions of these specimens from Moody, Franklin County, N.Y., I will add for comparison descriptions of a few other living specimens of *Eutænia sirtalis* examined this year:

11. *Sconooda Creeck, one-half mile east of Oneida, N.Y.* Dorsal stripe not apparent. Lateral stripes faint, but visible; yellowish brown. Sides below lateral stripes brown. Gastrosteges greenish. Ground color above lateral stripes dark olive brown. Spots present, but not apparent against the dark background.

12. *Same locality.* Dorsal and lateral stripes distinct, yellow. Sides below lateral stripes, and gastrosteges, greenish. Spots distinct. Ground color above lateral stripes olive brown.

13. *Rensselaer, Rensselaer County, N.Y.* Dorsal stripe conspicuous throughout; clear yellow. Lateral stripes fairly distinct. Sides below lateral stripes brownish green; gastrosteges dark greenish. Ground color above lateral stripes very dark brown, almost black. The location of the spots, on this dark background, is only indicated by the blackness of their interspaces, the normal interspaces being light greenish.

14. *Rochester, N.Y.* Dorsal stripe fairly conspicuous. Lateral stripes indistinct. Ground color above lateral stripes soft olive. Spots of chestnut scales, with black edges and interspaces.

15. *Ausable Forks, Essex County, N.Y.* Dorsal stripe dull yellow brown, but fairly distinct. Lateral stripes faint. Sides below lateral stripes brown. Gastrosteges brownish green. Ground color above lateral stripes dark greenish brown. Spots indistinct.

16. *Same locality.* Dorsal stripe very faint; dull dark brown. Lateral stripes visible; yellowish brown. Sides below lateral stripes dark brown. Gastrosteges grayish green. Above lateral stripes dark olive brown. Spots indistinct because of darkness of ground color; composed of scales only a little redder than the ground color, with black interspaces.

17. *Same locality.* Dorsal stripe rather faint; dull brown. Lateral stripes very faint. Sides below lateral stripes brownish green. Gastrosteges greenish. Ground color above lateral stripes greenish olive. Spots small and indistinct; composed of chestnut scales, with black edges and interspaces. Eight superior labials on each side resulting from the division of the (normal) second upper labial. Lower anterior portion of pre-frontal plates on each side divided, so as to give, in effect, two loreals, one above the other.

The following table gives certain data concerning the localities from which the specimens in the above list were obtained. In the cases of Moody, Rochester, Oneida, and Rensselaer the elevations given are those of the exact collecting localities.

Concerning the other localities I have no exact data as to the collecting range, and have therefore given the geographic position and elevation of the villages.

DATA CONCERNING LOCALITIES DISCUSSED.

	LOCALITY.	ELEVATION. A. T.	LATITUDE.	LONGITUDE.
1	Moody, Franklin County, N.Y.	1600'	44° 12'	74° 30'
2	Intervale, N.H.	546'	44° 15'	71° 25'
3	Ausable Forks, Essex County, N.Y.	600'	44° 26'	73° 41'
4	Westport, Essex County, N.Y.	271'	44° 11'	73° 29'
5	Rochester, Monroe County, N.Y.	280'	43° 12'	77° 36'
6	Oneida, Oneida County, N.Y.	440'	43° 06'	75° 39'
7	Rensselaer, Rensselaer County, N.Y.	60'	42° 38'	73° 44'

The specimens from Franklin County, N.Y., were collected by me during August, 1901, at Moody, a small settlement on the east shore of Tupper Lake. All the specimens from that locality described above (Nos. 1-10) were obtained at an elevation of about 1600 feet A.T. Though the ophidian fauna of the Adirondacks appears to be scanty, so far as species are concerned, the few species occurring within the region are represented by numerous individuals. The specimens above described were not selected because of color, but are simply those which reached the museum alive and in good condition. The locality is, of course, well within the Canadian life zone, and the specimens can therefore be compared directly with those described by Allen from Intervale, N.H.

As can be seen from the descriptions given (Nos. 1-10), the specimens obtained from this one small area furnished fairly good examples of three of the four subspecies credited to the Adirondacks, together with specimens intermediate between each pair of the three. If we omit the specific and higher characters, there is hardly one point in which the ten specimens agree. The dorsal stripe is, in most, somewhat indistinct; but in one specimen it is quite bright throughout, and in others barely visible. In color it varies from dull brown to yellow—never gray or grayish. The spots are usually of chestnut scales, with black edges and interspaces; but the chestnut

areas may be very small and only faintly reddish. The distinctness of the spots varies with the ground color. In one specimen the sides below the lateral stripes are dark green; in another, brownish green; in the remaining eight specimens, various shades of brown. In two specimens various characters have aided each other in such a way as to give a fairly uniform reddish brown coloration above the lateral stripes, thus even going a step beyond the condition shown by Cope's *Eutentia sirtalis obscura*. The gastrosteges vary in color from greenish gray to slate gray or even brown.

The general darkness of color is much accentuated by the age, not necessarily of the individual, but of the skin which the specimen is wearing at the time of examination. Six of the specimens brought from the Adirondacks have shed their skins since their arrival at the State Museum. Four of these had been examined with some care previous to this time, and reëxamination after shedding developed the fact that, while the markings are unchanged, the colors are sufficiently brightened by shedding to produce an impression of much lighter tint.

To sum up these statements, I find that ten specimens of the common garter snake obtained (by an unmethodical selection) from an area less than two acres in extent, located well within the Canadian life zone, represent, according to the criteria of various authors, the following subspecies:

NUMBER OF SPECIMENS REPRESENTED.			
<i>According to</i>	<i>E. s. sirtalis.</i>	<i>E. s. obscura.</i>	<i>E. s. pallidula.</i>
Baird	10	—	—
Cope	8	2	—
Allen	—	—	7 ¹

The specimens (Nos. 15, 16, and 17) collected by Mr. Van Allen Lyman near Ausable Forks, Essex County, N.Y., which is also within the Canadian life zone, exhibit similar variations.

¹ Three of the ten specimens show characters agreeing with neither of Allen's descriptions; the remaining seven would probably be accepted by him as *pallidula*, though few of them exhibit *all* the characteristics of that form.

The thirteen specimens so far discussed prove that the Canadian life zone contains garter snakes not exhibiting the characters of *pallidula*. An examination of the descriptions of specimens 11, 12, 13, and 14 (all of which are from points in the Transition or Upper Austral zone) will show that specimens exhibiting the characters of *pallidula* are not confined to the Canadian zone. It would seem impossible, therefore, to agree with Mr. Allen in assuming any relation between the characters of *pallidula* and the climate of the Canadian life zone. As a matter of fact, specimens exhibiting these characters may be found in almost any part of New York state. I believe that at the present time Mr. Ditmars has, in the New York Zoölogical Garden, living specimens of this type captured in New York City.

If, however, no relation can be established between the coloration of the form *pallidula* and any particular habitat, *pallidula* can no longer be regarded as a definite variation from the type, due to definite climatic conditions. It then falls to the same level as the form *obscura*, and apparently no reason can be given for assigning subspecific rank to either.

NEW YORK STATE MUSEUM,
December 5, 1901.